

OPISTHOBRANCHS FROM THE SOUTHWESTERN
CARIBBEAN SEA¹

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ABSTRACT

In the southwestern Caribbean Sea, off the coasts of Colombia and Panama, the research vessel JOHN ELLIOT PILLSBURY collected 13 species of opisthobranchs. New species and subspecies are: *Scaphander darius*, *Akera bayeri*, *Peltodoris hummelincki igla*, and *Nuvuca lurca*, g. n., sp. n. *S. darius* has a male organ similar to that of *S. lignarius*, but the penial papilla is beset with warts. *A. bayeri* is the first American representative of the genus *Akera*. By its dart and a gland annexed to the male organ, *Nuvuca* approaches *Audura* and *Jorunna*. Of the known species in the collection, one *Philine* has an immersed spire and each of the paired gizzard plates nearly the shape of half the unpaired one, like *Ph. infundibulum*. The other *Philine* is identical with *Ph. alba* from South California. Now it has been found in the Mosquito Gulf (295-109 m), hence is an amphi-American warm-water species.

INTRODUCTION

The material described in the following report was collected by Professor Dr. Frederick M. Bayer and other members of the staff of the Institute of Marine Science, University of Miami, during the Caribbean oceanographic cruise realized in July 1966 by the research vessel JOHN ELLIOT PILLSBURY off the coasts of Colombia and Panama, including the Gulf of Darien and the Mosquito Gulf. This center of the western part of the Caribbean Sea, between the Leeward Group of the Lesser Antilles and Yucatan, is nearly unknown regarding the opisthobranchs. Most of the present species were obtained from depths beyond 50 m. These depths and the area of collection endow the material with a great importance.

We thank Dr. F. M. Bayer for having intrusted us with the valuable collection and for his kindness in editing our manuscript.

LIST OF SPECIES

CEPHALASPIDEA

1. *Bulla occidentalis* A. Adams, 1850 (P-365, 372, 392).
2. *Haminoea elegans* (Gray, 1825) (P-367).
3. *Scaphander clavus* Dall, 1889 (P-381, 388, 394, 447, 448). Figs. 1-4.
4. *Scaphander watsoni rehderi* Bullis, 1956 (P-375, 445, 446). Figs. 5-9.

¹ Contribution No. 829 from the Institute of Marine Sciences, University of Miami.

5. *Scaphander darius*, spec. nov. (P-365, 392, 398, 402, 403, 425, 434). Figs. 10-17.
6. *Philine* cf. *infundibulum* Dall, 1889 (P-381). Figs. 18-22.
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8. *Akera bayeri*, spec. nov. (P-393). Figs. 29-38.

NOTASPIDEA

9. *Umbraculum plicatum* (v. Martens, 1881) (P-392). Figs. 39-41.

DORIDACEA

10. *Chromodoris neona* (Marcus, 1955) (P-319). Figs. 42-43.
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12. *Peltodoris hummelincki igla*, subsp. nov. (P-330). Figs. 45-47.
13. *Nuvuca lurca*, gen. nov., spec. nov. (P-396). Figs. 48-50.

EXPLANATION OF LETTERING

<i>a</i> —male atrium	<i>oa</i> —opaline gland
<i>ao</i> —Hancock's organ	<i>p</i> —penial papilla
<i>b</i> —insemination duct	<i>q</i> —prostate
<i>c</i> —columella	<i>r</i> —retractor
<i>d</i> —efferent duct	<i>s</i> —stylet (dart)
<i>f</i> —genital flap	<i>sr</i> —seminal groove
<i>g</i> —gill	<i>t</i> —spermatheca
<i>h</i> —head shield	<i>u</i> —ampulla
<i>l</i> —outer lip	<i>v</i> —vagina
<i>m</i> —mantle border	<i>w</i> —wart
<i>n</i> —female gland mass	<i>x</i> —annexed gland
<i>o</i> —spermoviduct	<i>y</i> —spermatocyst

SYSTEMATIC SECTION

1. *Bulla occidentalis* A. Adams, 1850

References.—Pilsbry, 1895a: 331; Locard, 1897: 51; Abbott, 1958: 99; Weisbord, 1962: 454.

Material.—Stations 365, 372, 392; 56-100 m. Three empty shells.

Further distribution.—From Cape Hatteras, North Carolina, to Florida, the Bahamas and the Gulf of Mexico. Antilles, south to Trinidad; Caribbean coast of Venezuela, Gulf of Paria and Miranda. Canaries, to 253 m (Locard, *loc. cit.*).

Remarks.—The shells are small, measuring 18×12 , 12×8 , and 16×10 mm. They are thin but solid, reddish with a coarse and sparse darker mottling. Basal spiral grooves are absent, but this character is frequent also in Brazilian *B. striata* (Marcus, 1955: 92). In the present shells the outer lip is broken along the edge, but comparison with our ample material from the coast of São Paulo shows that the apical end is less compressed and the aperture relatively more expanded in the shells from the Gulf of Darien, justifying our classification. It is true that American conchologists are nowadays inclined to consider *B. striata* Bruguière, *B. amygdala*, and *B. occidentalis* as variants of one species, due to the intergrades in the shape and sculpturing recorded in large collections.

The species lives in shallow water, where the empty shells are subject to transport by hermit crabs. Empty shells from deep water may be carried by regular undercurrents or by irregular fluctuation of water bodies.

2. *Haminoea elegans* (Gray, 1825)

References.—Pilsbry, 1895: 355; Marcus, 1957: 395; 1958: 35; 1963: 6; Warmke & Abbott, 1961: 141.

Material.—Station 367, 36-34 m. 1 empty shell.

Further distribution.—Southeast Florida and the West Indies; Curaçao and Bonaire; Brazil, Rio de Janeiro and coast of São Paulo.

Remarks.—A light yellow fragile shell, 13×8.2 mm, with the outer lip arising from the left side of the apical perforation and numerous fine, spiral grooves.

3. *Scaphander clavus* Dall, 1889

Figures 1-4

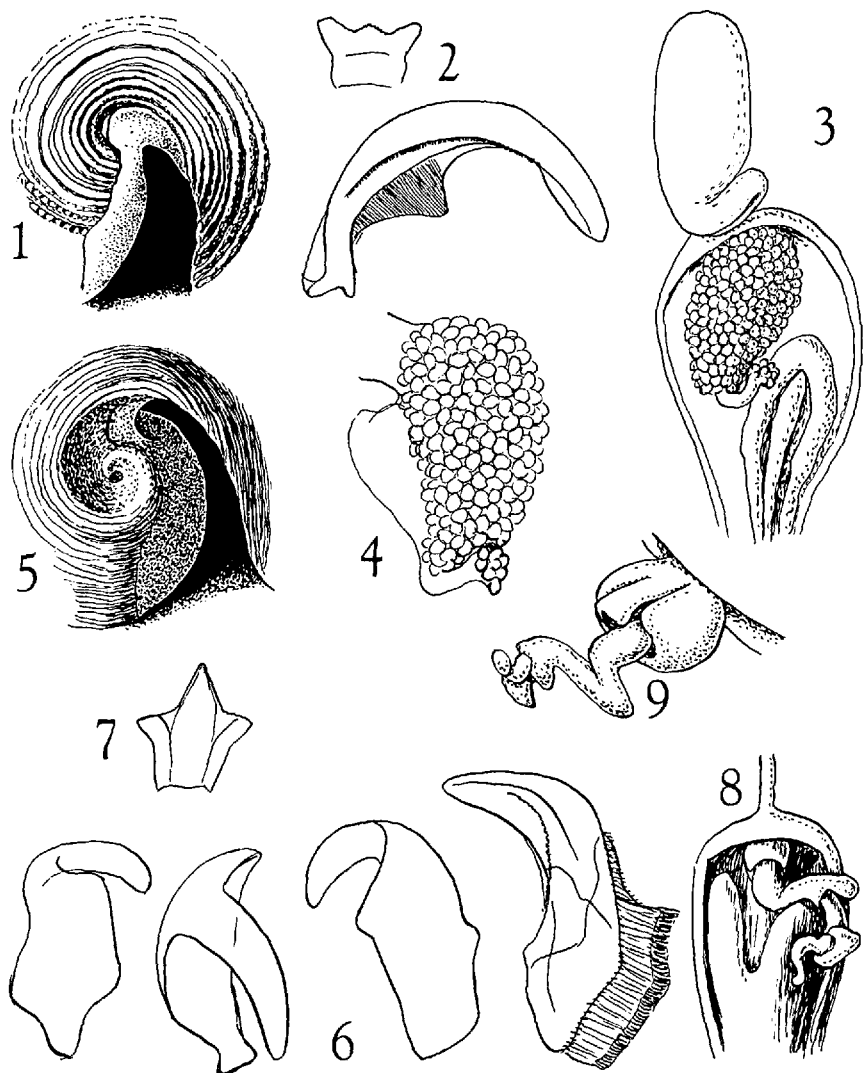
References.—Dall, 1889, p. 52 (*S. punctostriatus* var. *clavus*); Pilsbry, 1895a: 246; Bullis, 1956: 8 (*S. clavus*).

Material.—Stations 381, 388, 394, 447, 448; 416-1050 m. 11 empty shells, one snail (388).

Further distribution.—Off Mississippi Delta, $28^{\circ}47'30''\text{N}$, $88^{\circ}41'30''\text{W}$, 956 m (type locality); continental slope in the northern Gulf of Mexico, between 88° and $88^{\circ}33'\text{W}$, 357-585 m.

Dall's specimen of *S. punctostriatus* from 527 m off Barbados is *S. loisae* Bullis (1956: 8). Dautzenberg & Fischer's records of *S. punctostriatus* var. *clavus* from the Azores (1896: 401-402) refer to *S. loisae* or to *S. clavus*.

Description.—The stubby shells are 18.5-30 mm long and 15-19.5 mm wide. The greatest diameter is 60.0-68.5 per cent of the maximum length of the shell. In our measurements the backward-produced outer lip is included in the shell length. The periostracum is yellowish; when it is lost,



FIGURES 1-9.—1-4, *Scaphander clavus* Dall: 1, apex; 2, radular teeth; 3, male copulatory apparatus; 4, penial papilla.—5-9, *Scaphander watsoni rehderi* Bul-
lis: 5, apex; 6, lateral radular teeth in different positions; 7, rhachidian tooth; 8, opened male atrium; 9, everted male organ.

the shells are white. Except for the slightly flattened outer lip the profile resembles that of *Bulla occidentalis*. The apex is blunt, only slightly overtopped by the outer lip. The broad apical depression is filled with a heavy

callus (Fig. 1). In an 18.5-mm shell as well as in one 28.0 mm in length about 85 spiral striae occur. The striae are more distinct in the periostracum than in the underlying shell; the latter shows the growth lines better. The punctations are generally rectangular as indicated by Bullis (p. 9), with whose description and photograph of the type specimen (Fig. 2, I) the present material agrees so well, that we refer to them for further details.

The whitish animal from Station 388, the first recorded of this species, is 37 mm long, and its shell measures 28×18.5 mm. The head shield measures about 12 mm in length and in width; it is broadest behind the middle and somewhat narrowed in front. The anterior and posterior borders are concave as in *S. lignarius* (Pilsbry, 1894: Pl. 32, Fig. 24; Perrier & Fischer, 1911: Pl. 5-6, Fig. 10). But evidently the shape varies alive; in Guiart's figure (1901: Fig. 9) the head shield is broader in front.

The pallial caecum of *S. clavus* is flat, wide at its origin, narrow and pointed at its end. The intrapallial gland, a peculiar gland of *Scaphander* (Perrier & Fischer, 1911: 76, 77, Figs. L, M), is distinct though small. The salivary glands are short.

The radula (Fig. 2) consists of 23 rows. As in the other species of *Scaphander*, and in other genera, it is a pincer-radula (Pruvot-Fol, 1926: "radula-griffe"), because the cusps of the right and left lateral teeth incurve over the row of the colorless rhachidian teeth, where they interlock. Therefore, Bullis' comparison with a zipper (1956: 4) is better than Schepman's (1913: 465) with the ribs of a quadruped. The rhachidian tooth is very thin, 142μ broad and 120μ high. Its lateral corners are distinct; the low middle point is slightly crenulate. The central teeth of *Scaphander* are known to be caducous (Thiele, 1931: 392). In Bergh's material of *S. lignarius* and *S. punctostriatus* they had fallen off along the entire radular ribbon and were only found in the radular sac (1901: 265, 273). Evidently Bullis (p. 3) examined radulae in this state and affirmed that in *S. nobilis*, *S. punctostriatus*, and *S. watsoni* they consist solely of paired laterals. He mentions *S. lignarius* in this connection too, but also that species has a rhachidian tooth (Vayssière, 1885: 27; Bergh, *loc. cit.*; Pruvot-Fol, 1954: 56, 58). The lateral teeth of *S. clavus* are about 600μ long, brownish yellow. Their base, which is fastened deep in the radular membrane, is striped and fibrous, so that a hairy aspect results. The cutting (or better, grasping) edge bears denticles which are irregularly distributed. Of these fine denticles 25 were counted along a $26\text{-}\mu$ -long stretch of the cusp.

The paired gizzard plates measure 10×8.5 mm, the unpaired one 6×0.6 mm; it is 2.3 mm high. This accessory gizzard plate whose dorsal position is not constant, has the "outer edges pinched together lengthwise" (Bullis, 1956: 6, Fig. 5, b, c). In *S. lignarius* the accessory plate has the same shape (Lacaze-Duthiers, 1898: Pl. 27, Fig. 2, pm; Bergh, 1901:

268). The crop contains hard, calcified, rolled Isopoda, perhaps Sphaeromidae, and calcareous algae.

The male copulatory apparatus (Figs. 3, 4) has a total length of 15 mm, of which 8 belong to the atrium, 4 to the high-celled glandular prostate. The penis proper is a bulbous organ studded with small warts and ending with a pedunculate knob, also with warts. The atrium contains a long ridge.

4. *Scaphander watsoni rehderi* Bullis, 1956

Figures 5-9

Reference.—Bullis, 1956: 6, 13.

Material.—Stations 375, 445, 446; 109-342 m. Two empty shells and two containing the snails (445, 446).

Further distribution (of *S. watsoni rehderi*).—Gulf of Mexico, 29°10'N, 88°03'-88°33'W, 358-549 m; living animals in 366-512 m.

Further distribution (of *S. watsoni* without restriction to living animals and without distinction of the subspecies).—From Cape Hatteras to Florida; Gulf of Mexico to Campeche Bank; Cuba; Sombrero Island (18°38'N, 63°29'W); Barbados, 92-915 m; Venezuela, Los Testigos (Dautzenberg, 1900: 156).

Description.—The rather solid shells are 24-35 mm in length and 13-18 mm in width; the maximum width is 50-54.1 per cent of the maximum length. As Bullis (p. 13) distinguished between the length of the shell (39.3 mm) and the maximum length (41.0 mm) which includes the posterior extension of the outer lip, and based the proportion upon his length of the shell, his proportion (53-57 per cent) is higher than ours. The color is cream to light rusty; without periostracum the shells are white. The outer lip is evenly curved, or flattened only for a short extent in the middle. Its posterior extension surpasses the length of the axis by 1-1.5 mm. A keel from the outer lip surrounds the sunken apex (Fig. 5). The reflected callus is very narrow (about 0.5 mm), continues as a thin layer of the parietal wall and extends a little into the apical depression.

The narrow spiral grooves are inaequidistant and consist of densely set punctations. In three shells the number of striae is 95 (shell lengths 35 and 24 mm) and 105 (32 mm). This count is subjective, because new grooves develop gradually.

The present animals have shells 32×16 and 33×17 mm long, and are 35 and 33 mm long, respectively. The body is yellowish white. The head shield of the 35-mm animal is 15 mm long, 11 mm broad; in both specimens it is pointed in front and slightly notched.

The pallial caecum is wide and not as pointed as in *S. clavus*. The salivary glands are longer than in *S. clavus*.

The radula comprises 19 rows. The umber-brown lateral teeth (Fig. 6) are about $530\ \mu$ long, striped at the base and provided with a short crest of denticles on the grasping edge. The rhachidian tooth (Fig. 7) is $160\text{--}200\ \mu$ broad and $140\text{--}170\ \mu$ high. Its lateral corners are more horizontal than in *S. clavus*, and the median point is bigger.

The crop contains bivalves and large foraminifers. As a strange consequence of different contraction the gizzard, of nearly equal size in *S. clavus* and *S. w. rehderi*, lies behind the heart in the former and in front of it in the latter.

The paired gizzard plates are 9×7.6 mm; the unpaired one is 6.5 mm long, 1.5 mm wide at the ends and 0.7 mm in the middle, where its edges are pinched together as in the preceding and the following species, and in *S. lignarius* and *S. mundus* (Marcus, 1966: 157).

The male copulatory apparatus is fully developed in the dissected 33-mm snail (Fig. 8); its prostate is 3 mm long, the following efferent duct 7 mm, and the atrium 7 mm. The latter contains a flagelliform penis about 2.5 mm long, surrounded by a large collar at its base (Fig. 9). In the middle the penis bears a diverticulum and at its end a small appendage.

5. *Scaphander darius*, spec. nov.

Figures 10-17

Material.—Stations 365, 392, 398, 402, 403, 425, 434; 47-174 m. 13 empty shells, 3 snails (402, 425, 434: the holotype).

Description.—The slender shells (Fig. 10) are 11-21 mm long and 5-10 mm wide. The maximum diameter is 44.1-49.6 per cent of the maximum shell length. There is no relation between a long shell and a wide or narrow diameter, e.g., the narrowest shell is 17 mm long, the widest are 12.5 and 14 mm long, and the longest shells have diameters of 47.5 and 47.6 per cent. The color of the shells with periostracum varies from cream to light brown; those without periostracum are white. The greater part of the outer lip is almost straight. From its small posterior extension (0.4 mm high in the holotype) a keel runs around the calloused apex which is insunk and imperforate (Fig. 11). The concave columella is bordered by a reflected white callus which flattens along the body whorl. Viewed from the front, all the whorls are visible within the columella.

The spiral striae are continuous, broader in the middle than in front and behind. Their number varies without a strict correlation with the lengths of the shells: 115 spirals in a 21-mm shell, 90 in 20-mm and 15-mm shells, and 65 in a 12.5-mm shell. The punctuation of the striae is brought about by the scalloped edges of the grooves (Fig. 12). The axial growth lines are more or less distinct.

The shells of our three animals are 13.5×6.5 , 14.5×6.5 , and 17×7.5

mm (the holotype). The body of the first two snails was light, that of the third slaty grey with a dark band along the mantle border. The smallest and the largest animal, the holotype, were dissected. The head shield of the latter is 7 mm long, 6 mm broad, and rounded in front. The pallial caecum begins wide and ends pointed. The small intrapallial gland is a firm organ. The salivary glands are small. The crop contained large foraminifers.

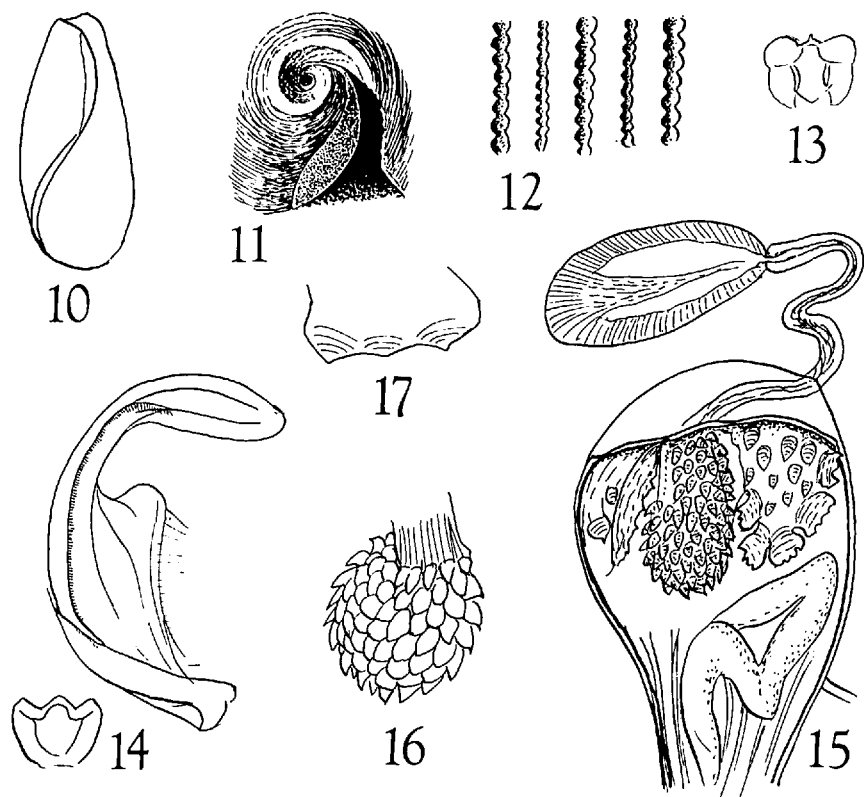
There are 18 radular rows, 5 of which have the delicate, transparent rhachidian tooth preserved (Figs. 13, 14). This is $82\ \mu$ in width, and $60\ \mu$ high. The lateral corners are rounded, the middle point is minute. The yellowish lateral plates are $350\ \mu$ long (Fig. 14). Their anterior end, about $100\ \mu$ in length, is dilated, somewhat spoon-shaped. Farther behind begin the 90 to 100 fine denticles. They are not yet developed in the youngest rows. They begin in the third row, and reach about $5\ \mu$ in the 8-9th row, where they occupy $160\ \mu$ of the grasping edge. In rows 16-18 the denticles are worn. The base of the lateral teeth is fibrous as in the other species.

The paired gizzard plates of the 13.5-mm snail measure 3.33×2.94 mm; the unpaired plate is 2.3 mm long, 0.6 mm broad at the ends, 0.2 mm in the middle. The paired plates of the 17-mm snail are 5 mm long. The unpaired plates of both animals have the outer edges pinched together as in the preceding species.

The male copulatory apparatus (Fig. 15) is fully developed only in the 17-mm snail. Its prostate is 2.5 mm long, the efferent duct 4 mm, and the atrium 5 mm. The penis differs from that of *S. clavus* and *S. w. rehderi*; it resembles that of *S. lignarius* (Lloyd, 1952: Fig. 6), but is different in details. From the fundus of the atrium a papilla arises, beset with warts which are $100\ \mu$ in height and diameter. Besides this papilla there are several medium-sized warts on the atrial floor, and some broad knobs composed of coalesced warts, up to $900\ \mu$ (Fig. 17). Evidently the atrial ridge in front of the retracted penis supports the base of the everted papilla. In the isolated penial papilla of Figure 16 the warts are concentrated to a spiny globe.

Discussion.—The anatomical characters as well as several details of the shell of *S. darius* are similar to the East Atlantic *S. lignarius* (Linné, 1758), whose small specimens (var. *minor* Locard, 1897: 42-43) are as long as the present species. It is true that the size of a cephalaspidean species may be different in the populations from different localities (Guiart, 1901: 42, Fig. 17), but the proportion between the greatest diameter and the maximum length of the shell is significant, and this is much greater in *lignarius* (Pilsbry, 1895a: 249; Nobre, 1938-40: 91; and others) than in *darius*.

The proportion of the maximum width to maximum length in *S. watsoni* Dall, 1889, differs less from that of *darius*. Its minimum, about 48 per cent (Bullis, 1956: 5) overlaps with the maximum of *darius*, 49.6 per cent. The similar width refers to *watsoni watsoni* Bullis, which differs from *darius*



FIGURES 10-17. *Scaphander darius*, sp. nov.: 10, shell; 11, apex; 12, sculpture of shell; 13, rhachidian tooth of type-specimen; 14, radular teeth of other specimen; 15, male copulatory apparatus; 16, penial papilla; 17, coalesced wart of penial papilla.

by the shape of the unpaired gizzard plate. Moreover the outer lip of *watsoni* as well as that of *lignarius* overtops the apex more than in *darius*, and both species are more dilated in front.

With regard to the less pronounced posterior attenuation and the slightly produced outer lip, *S. pilsbryi* McGinty (1955: 82) comes nearer to our species than *lignarius* and *watsoni* do. Its maximum width is 52.3 per cent of the maximum length, and its anterior dilatation is as broad as that of *lignarius* and *watsoni*, hence surpasses that of *darius*.

6. *Philine* cf. *infundibulum* Dall, 1889

Figures 18-22

References.—Dall, 1889: 57; Pilsbry, 1895b: 23; Johnson, 1934: 149.

Material.—Station 381; 724-597 m. 2 specimens.

Distribution of Ph. infundibulum Dall.—Bermuda; Straits of Florida; Antilles, south to Barbados, 216-680 m, 6-18°C.

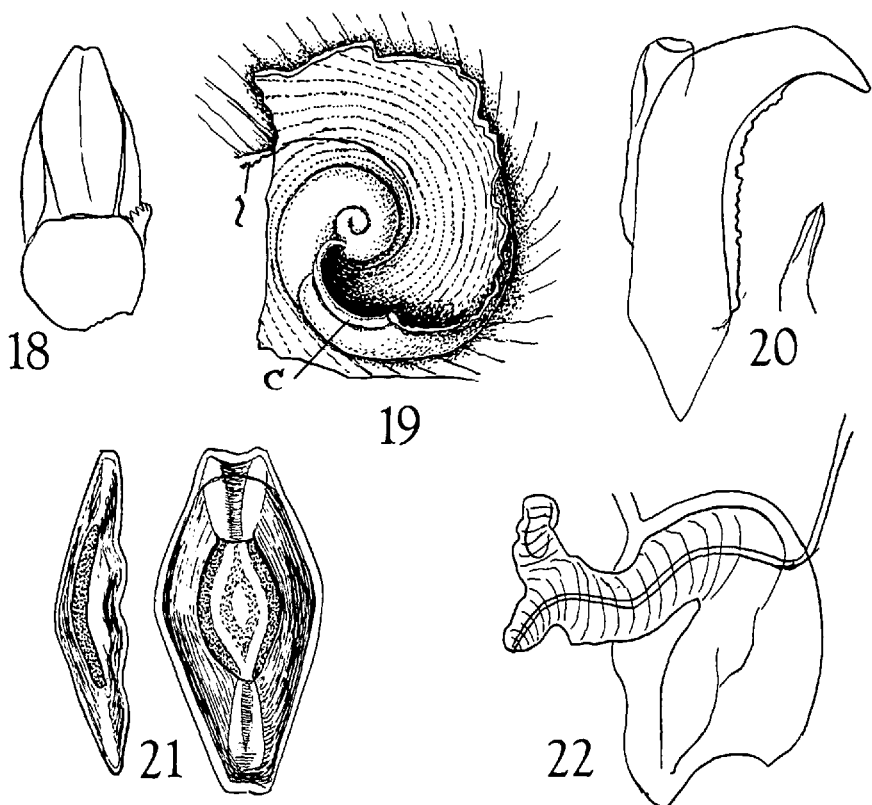
Description.—The animals are 28×12 mm and 26×12.5 mm (Fig. 18). The head shield of the 28-mm specimen is about 17 mm long, 9 mm broad in its anterior third, and grooved in the midline. It ends truncate in front of the rather convex visceral hump. The epipodia are well developed. The sole is 20×13 mm; its greatest width lies in the middle of the body. The inferior pallial lobe is square and lies behind the hind end of the sole.

Both shells were broken to pieces: they are about 12 mm long and 10 mm broad. The piece containing the entirely immersed spire was complete and is drawn from the inner side (Fig. 19) to show the protoconch and the beginning of the open columella. From above the posterior junction the outer lip descends spirally upon the apex with a sharp ridge. This conforms well with Dall's description. The sculpture is spiral around the apex and curves outwards forming growth lines on the body whorl.

The radular formula is $24 \times 1.1.0.1.1$. The yellow, broad inner lateral tooth is 520μ high, has an irregularly serrate inner edge, and a round flap on the outer edge. The colorless, straight outer lateral tooth (uncinus) is 120μ high (Fig. 20). The gizzard plates (Fig. 21) agree exactly with Dall's description; they have no foramina. The unpaired plate is biggest, lozenge-shaped, 9 mm long, 4.5 mm wide, and 2.1 mm thick. Each of the paired plates is nearly the shape of half the large one, 8.5×2 mm. The crop contains calcareous algae and big foraminifers.

The male organ corresponds to that of the often figured *Ph. aperta* (Brown, 1934: Fig. 25; Lloyd, 1952: Fig. 4). The hammer-shaped penial papilla is 1 mm long (Fig. 22).

Discussion.—In *Philine*, the gizzard plates are a good character for classification (Odhner, 1926: 18). They led us to approximate our specimen to Dall's unfigured species. The size of the shell and the proportion between width and length are similar. *Ph. candeana* d'Orbigny is distinctly narrower and differs from the present shell by the projecting spire (d'Orbigny, 1853: Pl. 4, Fig. 3). Even more than the fine spiral lines of *infundibulum*, its undescribed radula obliges us not to unite our snail with it. The subgenera of *Philine* are now beginning to be considered as genera (Pruvot-Fol, 1954: 64, 71; Allen, 1962: 38). If this tendency continues, our specimen with its radula 1.1.0.1.1 might be separated from the type species with 1.0.1. As long as the radula of *infundibulum* Dall is not known, this would be



FIGURES 18-22. *Philine* cf. *infundibulum* Dall: 18, preserved snail; 19, inside of apex of broken shell; 20, radular teeth; 21, inner side of gizzard plates; 22, opened male atrium.

inconvenient, as the example of *Volvaria canaliculata* Say, 1826, shows. As Thiele (1925: 268) did not find a radula, it was allotted to *Retusa* (Abbott, 1958: 101; Moore, 1961: 32), whose species have no radula (Hurst, 1965: 336). Later on the radula was observed (Wells & Wells, 1962: 90), hence the species must be included in *Acteocina*, better called *Tornatina* (Marcus, 1958: 41).

7. *Philine alba* Mattox, 1958

Figures 23-28

Reference.—Mattox, 1958: 98-104.

Material.—Station 446; 295-109 m (trawled up steep slope). One specimen.

Further distribution.—Southern California, near Catalina Island; Lower California, San Benito Island, 46-247 m.

Description.—The whitish animal is 38 mm long, 28 mm broad, and 17 mm high (Fig. 23). The head shield is 25 mm long, and as wide as the body. It extends over the visceral hump with a long concave flap. The epipodia are short and narrow. The broad foot reaches nearly the hind end of the visceral hump. In ventral view only a very small part of the inferior pallial lobe is visible on the left side behind the 33-mm-long sole.

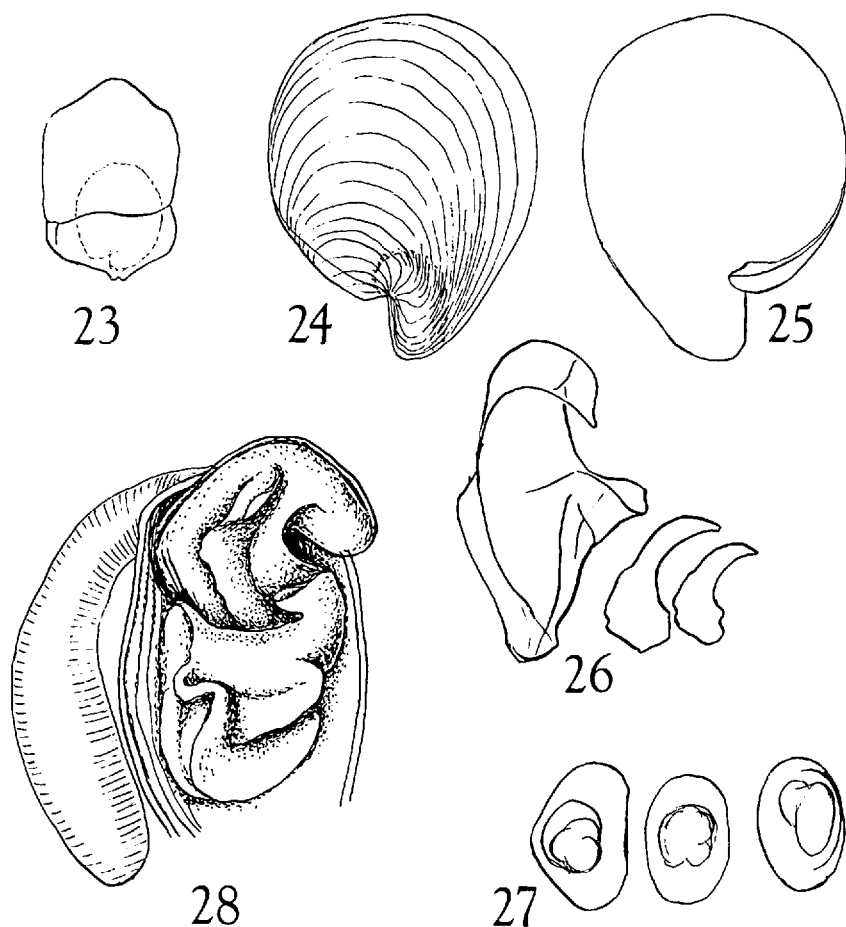
The clam-shaped shell (Fig. 24) is relatively solid for the genus, and 22.5 mm long, 17.5 mm wide, and about 7 mm high. It is white with a slightly pink periostracum. The outer lip follows the long axis of the shell backwards for 5 mm, turns to the right and curves evenly around the aperture. The parietal wall is very short, covered with a thin glaze, and prolonged inwards with a flange-shaped callus (Fig. 25). The backward lobe of the outer lip is slightly elevated and marked by a curved groove from the apex to the edge. The sculpture of the shell consists, as in Mattox's photograph 2, of distinct growth lines, which he called "spiral striae."

The radular formula is $16 \times 2.1.0.1.2$. The teeth (Fig. 26) are dark grey with horny yellow tips. The inner tooth is stout, 800 μ high, and smooth. Mattox found serrations on the median edge. "The presence or lack of serrulation of the teeth has again and again proved valueless as a systematic character in *Philine*" (Lemche, 1948: 64). The first outer lateral tooth is 400 μ , the second 260 μ high; both have hook-shaped cusps. The dark brown gizzard plates (Fig. 27) are very small, thick and round. They have no foramina. Their length is 2.6-2.9 mm, the width 1.8-2 mm, and the height 1.9-2 mm.

The male atrium is an 8-mm-long, almost globose organ. It lodges the richly folded, bilobed penis (Fig. 28) with an open seminal groove. The 7-mm-long prostate is much shorter than in the type species of *Philine* (Brown, 1934: 197; Lloyd, 1952: 16-20).

Discussion.—The only character whereby our material differs from that of Mattox is the shell, which in the 164 original specimens was described as "thin and fragile." The shell in the genus *Philine* is called "extremely thin, almost membranous" (Keen, 1963: 18) in contrast with *Bulla*, *Scaphander*, and *Haminoea*. Our shell of *Ph. alba*, however, is not thinner than that of *Haminoea elegans* of the present collection, hence heavy compared with other species of *Philine*. Environmental conditions may be responsible for the difference between Mattox's material and ours. A single thick shell of an Atlantic *Ph. alba* does not justify a subspecific separation from the thin Pacific form.

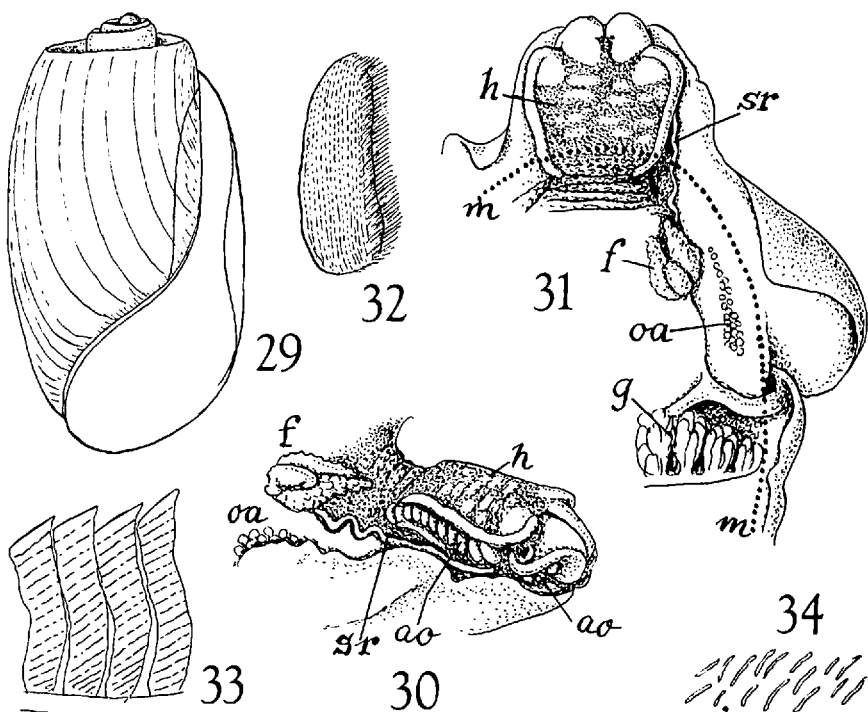
As Mattox restricted his comparison to the few species of the North American Pacific coast, and to the anatomically well known type species of *Philine*, we went through our available literature. We found a species



FIGURES 23-28. *Philine alba* Mattox: 23, preserved snail; 24, shell from above; 25, shell from below; 26, radular teeth; 27, gizzard plates; 28, male copulatory apparatus.

with very wide aperture, *Ph. apertissima* E. A. Smith (1902: 8), known only from the Ross Dependency, Cape Adare. Its outer lip is not produced, and so the general shape of the shell is quite different from that of *Ph. alba*.

The monotype of the subgenus *Philinorbis* Habe, 1950 (quoted from Zilch, 1959: 31), has a similar general form of the shell, a produced outer lip, and a small calloused spire. However, the body whorl bears numerous spiral striae, and these are considered as systematically important in *Philine* (Lemche, 1948: 61), though not in *Cylichna* (*ibid.*: 57).



FIGURES 29-34. *Akera bayeri*, sp. nov.: 29, shell; 30, lateral view of head; 31, anterior part of body, mantle (*m*) removed; 32, jaw; 33, elements of jaw; 34, palatal rodlets.

8. *Akera bayeri*, spec. nov.

Figures 29-38

Material.—Station 393; 87 m. One specimen.

Description.—The delicate, fragile shell (Fig. 29) is 11.5 mm long and 6.5 mm in greatest diameter. It is oval-cylindric and consists of $3\frac{1}{2}$ whorls, an uptilted apical nucleus, a low but projecting, truncate and terraced spire. The body whorl forms most of the shell. All the whorls can be seen from the front through the open, spirally descending, thin columella. The shoulder of the whorls is keeled, the conchinous suture ends at the anal slit (Perrier & Fischer, 1911: Fig. W, on p. 132). In the preserved specimen the shell was transparent; it became opaque when dry. The periostracum is colorless.

The body whorl has sharp growth lines; the thin spiral striae are indistinct, a little less so in the dry shell. The aperture is nearly as long as the shell, narrow behind, widening gradually in front. The especially fragile

outer lip is slightly convex in the middle. The very concave columella bears a thin reflexed callus, connected with a thin glaze on the parietal wall.

In the preserved snail the body was retracted so far that only 1 mm of the head stood out over the shell; the foot with the short parapodia covered the anterior third of the aperture. The color of the flesh was yellowish green; the mantle under the shell bore a pattern of brown lines. The head shield (Figs. 30, 31, *h*) is brown, with thickened white borders. The shield is notched over the vertical mouth slit and on both sides. Therewith four bulges are brought about; the lateral notches lodge the eyes (Fig. 30). The anterior bulges overlies the first three ridges of the Hancock's organ (*ao*), the posterior bulges cover the 10 broad posterior ridges. Under the right eye, the seminal groove enters the male atrium. The groove runs under a white ridge (*sr*). Behind, the lateral borders of the shield bend towards the middle, forming a rather distinct limit between head shield and neck in the preserved snail.

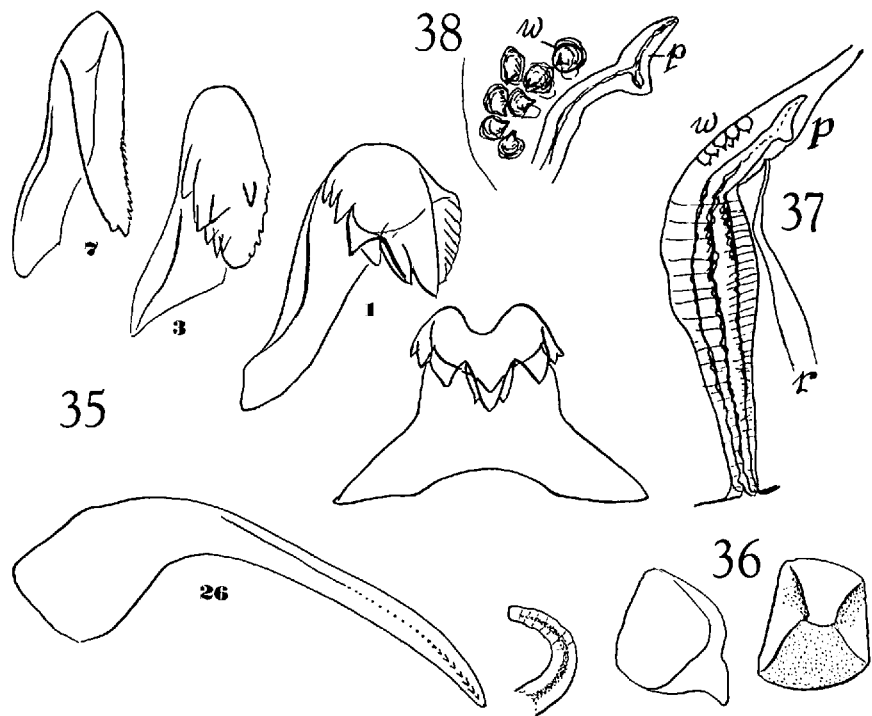
The neck is wrinkled transversely. The genital opening is hidden by a tripartite flap (*f*). Behind it lies the multiple white opaline gland (*oa*). The pallial caecum is a little longer than the body whorl, but does not reach the tip of the visceral sac. The grooved filament extending from the posterior border of the inferior mantle lobe, the so-called cloacal tentacle, is quite short (1 mm); it is known to be very contractile (Bergh, 1900: 166, 169).

The longish jaws (Fig. 32) are 530 μ in length, 230 μ in breadth. Their elements (Fig. 33) measure 10 μ at their bases and stand in about 20 longitudinal rows. On the outer half of the jaw they are flat platelets, but increase in height towards the middle, where they are obliquely stratified pegs, up to 66 μ in height. The weak palatal rodlets (Fig. 34) are 45 μ long.

The radular formula is $35 \times 28.1.28$. The central tooth (Fig. 35) is 78 μ broad at its base, and 52 μ high. It is deeply excavated anteriorly and bears 3-4 denticles of different sizes on either side of the median cusp. The cusps of all lateral teeth bear extremely fine denticles on the inner side. On their outer side the blunt inner lateral teeth have strong irregular denticles which decrease to the 7th. Outward the lateral teeth increase in length to 160 μ . The outer teeth have rather narrow pointed cusps.

The oesophagus was strongly folded and contracted; the gizzard contains 4 small curved, 4 middle-sized, and 4 large teeth (Fig. 36). The smaller ones are green. The alimentary tract was empty, except for several loose green teeth in the stomach.

The hermaphrodite system differs from that of Mazzarelli's (1891: Fig. 6) and Guiart's figures (1901: 154, Fig. 94) by an uncoiled but long and stretched pallial gonoduct. The male copulatory organ (Fig. 37) has a 2-mm-long, entally widened atrium. It is strongly muscular, and the epithe-



FIGURES 35-38. *Akera bayeri*, sp. nov.: 35, radular teeth; 36, gizzard plates; 37, male copulatory apparatus, clarified; 38, detail of same.

lium forms 2 high ridges flanking the seminal groove. There is an ental hollow continuation of the atrial fundus, not a prostate (Mazzarelli, 1891: 243). The fundus lodges a bicuspid papilla (*p*) pierced by the ejaculatory duct. Beside the papilla, the wall of the atrium bears a group of 7 muscular warts (*w*) topped with cuticular spines (Fig. 38).

The species, the first *Akera* from American waters, is named for Dr. F. M. Bayer, whose tentative classification shows that he was aware of the singularity of this snail.

Discussion.—All but one of the species of the genus *Akera* mentioned by Pilsbry (1895a: 377-379), Locard (1897: 62-64), and Habe (1950: 24) have a flattened spire. The only exception is *A. soluta* (Gmelin, 1791), recorded from South Africa to the southern and eastern coasts of Australia, and probably from the Miocene of Vienna (Berger, 1958: 88). Anatomically, *A. soluta* was examined by Bergh (1900: 308-312) and Perrier & Fischer (1911: 127 ff). The rhachidian tooth of *A. soluta* bears 8 denticles of nearly equal size on each side. The cusps of the inner lateral teeth are

more slender and more uniformly serrate on the outer side. The outer lateral teeth have smooth cusps. Warts on the wall of the penial sheath were not described for *A. soluta* nor for *A. bullata*. The "papilles charnues placées au fond du sac pénial" (Vayssière, 1885: 167) evidently refer to the bicuspid penial papilla, not to warts on the wall.

Geographically less distant from *A. bayeri* is *A. bullata* O. F. Müller, 1776, which ranges from about 71°N (littoral of the Porsanger Fjord, Odhner, 1939: 11) and the Faroes (Lemche, 1929: 5), the European coasts, including the Western Baltic and the Mediterranean, to Madeira (Watson, 1897: 271). The spire of *A. bullata* is nearly flat, and the radula (new figure in Morton & Holme, 1955: Fig. 2 C) is different too. The last authors stress the aplysiomorph character of the radula of *Akera*. They are right, but also the radula of *Haminoea* is similar.

Guiart (1901: 197), Thiele (1935: 1097-98), Boettger (1955: 272), Morton & Holme (1955: 108-111), and others, discussed the relationships of the Akeratidae. Pruvot-Fol (1954: 91) mentions Vayssière in this connection, but she means Perrier & Fischer (1911: 178). In our above list *Akera bayeri* appears as an anaspidean (Taylor & Sohl, 1962: 12), not because this "placement is no longer disputed" (Ghiselin, 1965: 369-70), but because in the present faunistic paper a new discussion is inappropriate. If we were writing a treatise, we would place *Akera* among the Cephalaspidea, because it has a head shield which renders a diagnosis of the Anaspidea impossible, if it is included in that order. A head shield not set off from the neck occurs also in other Cephalaspidea (Odhner, 1926: 14-15).

9. *Umbraculum plicatulum* (v. Martens, 1881)

Figures 39-41

Reference.—Pilsbry, 1896: 178.

Material.—Station 392; 74-78 m. One specimen.

Further distribution.—Dry Tortugas; Florida; Cuba.

Remarks.—The preserved animal is 21 mm long, 16.5 mm broad, and 12 mm high. The soft parts were uniformly dull yellow (Dr. F. M. Bayer). The length of the shell is 18, the width 15.5, and the height 2.5 mm. The apex projects 11 mm behind the anterior border of the shell and $\frac{2}{3}$ of the breadth from the left border. The periostracum is caducous and felt-like in a marginal ring. The gut contains sponge tissues and spicules.

The conchological characters which separate the few circumtropical and subtropical species of the genus "are neither very obvious nor of much value" (Pilsbry, 1896: 177). This holds especially (*ibid.*: 178) for the present species and the neighboring *U. ovale* (Carpenter, 1856) recorded from Lower California, Cape San Lucas, to Panama (Keen, 1958: 504). The external characters, described in detail by O'Donoghue (1929: 36-38)

are similar in all species. Often yellow, red, and brown colors and intermediate tones are mentioned in the descriptions.

Pilsbry (*loc. cit.*) examined the radula of *U. sinicum* and said: "it has more numerous teeth than any other mollusk known to me." They are needle-like, strongly recurved toward their apices, the cusps narrowly lanceolate and smooth. O'Donoghue's description (p. 38) is consistent with the present young specimen, though this has still only 84 rows and 240 teeth in the newest half-rows. At first sight, the teeth of *U. plicatulum* (Fig. 39) can be distinguished from those of *U. mediterraneum* (Pruvot-Fol, 1954: Fig. 81 c) and *U. sinicum* (O'Donoghue, 1929: Pl. 3, Fig. 36), and are more like those of *U. pictum* (Bergh, 1905: Pl. 13, Fig. 11). But we have seen too many different aspects of the commonplace radular hooks in the likewise spongivorous doridids to attribute specific value to those of *Umbraculum*. To determine a possible specific variation of the numbers of rows and teeth in the half-row, several animals of different ages from the same locality should be available. The shape of the male copulatory organ and its structure have not yet been considered for the taxonomy.

Ghiselin (1965: 346, 371, 372) assumes the existence of a closed efferent duct (the "vas deferens" of his terminology) in *Umbraculum*. His source, Eliot (1910: 91), indeed mentioned the genus together with other opisthobranchs with a tubular duct. We do not know of any publication of Eliot in which *Umbraculum* is described. Perhaps Eliot added *Umbraculum* to his short list, assuming that its male organ had the same structure as in *Tylo dinella trinchesei* (Mazzarelli, 1897: 603), whose gonoduct separates into a male and a female duct at its origin, hence corresponds to Ghiselin's androdiaulic type (p. 341). Like *U. mediterraneum* (Vayssière, 1885: 142-144), *U. plicatulum* has a pallial gonoduct with an inner longitudinal fold separating the male and the female pathways, with a clustered prostate annexed to the former, and the seminal receptacle and bursa to the latter. The male half-canal continues as a seminal groove along the concave side of the curved penis (Fig. 40). Blood lacunae in the penis (Fig. 41) indicate that it is erectile. The seminal groove ends at the tip of the penis. The female aperture lies at the root of the male organ. This was correctly described by Pruvot-Fol (1960: 190, note 1), but her "véritable pénis," a thin, filiform and perfectly retractile organ, does not exist in *U. plicatulum*.

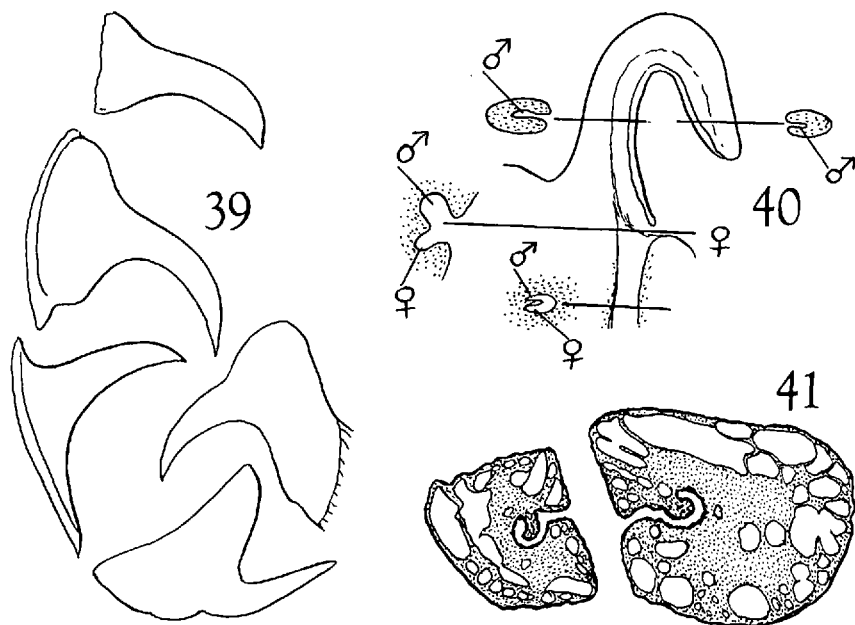
10. *Chromodoris neona* Marcus, 1955

Figures 42-43

References.—Marcus, 1955: 124; 1957: 419.

Material.—Station 319. One specimen.

Further distribution.—Florida, Palm Beach Shores and Biscayne Bay; Brazil, Cabo Frio and coast of São Paulo (original locality).



FIGURES 39-41. *Umbraculum plicatum* (v. Martens): 39, different aspects of radular teeth; 40, diagram of male copulatory organ with some transverse sections; 41, transverse section of penis.

Description.—The length of the preserved slug is 8 mm, the width 4.8 mm. A color photograph of the anterior part shows a bluish white ground with red and opaque cream meshes, and a red marginal line. The rhinophores are violet. Figure 42 gives the aspect of the preserved slug whose color had faded out. In life, the net extends farther forward and appears also in front of the rhinophores.

The broad, flat notum is smooth. The rhinophores, which have about 16 leaves, stand 1 mm behind the anterior tip. The 12 unipinnate gills begin 1.5 mm in front of the posterior end. A ventral view shows the roughly triangular head with a longish mouth, the grooved tentacles apposed to the head, the semilunar anterior border of the foot, the very narrow and folded sole, and the pointed tail projecting a little beyond the hyponotum. Some spicules lie to the sides of the central organs, the whitish reproductive system and the blackish digestive gland.

The labial elements are rodlets with bifid tips; they are up to $22\ \mu$ long and $3\ \mu$ thick. The length of the radula is $770\ \mu$, its width $650\ \mu$. It consists of 33 rows, with 33 teeth in the half-row. The rhachis bears a $20\ \mu$ high tooth without cusp. The innermost lateral tooth has a $31\ \mu$ high base, a strong principal cusp flanked by 1-2 inner and 4 outer denticles. The

size of the following teeth increases to $40\ \mu$ or a little more, they have 6-7 denticles on the outer side of the principal cusp. The outer teeth of the half-row are a little shorter; as many as 8 of them bear inner and outer denticles, so that the whole blunt cusp is denticulate. The salivary glands are long and smooth.

The slug is mature, and its spermatocyst contains allosperms. The prostatic part and the following muscular efferent duct are clearly differentiated. The vagina is short and straight. There is no vestibular gland.

Discussion.—The color of the living specimen is only known for the anterior part, but this agrees well with *Ch. neona*. Some other characters however, are different. The number of gills is greater (12) than in typical *neona* (9), though the present animal is shorter than the specimens from Florida and Brazil. The salivary glands of typical *neona* were described as rather short (Marcus, 1955: 125), but their length is taxonomically significant only in extreme cases. The most weighty difference is the absence of a cusp on the rhachidian tooth in the specimen from Panama, though the height of this tooth is not smaller than in the previously seen specimens of *neona*.

11. *Thordisa* spec.

Figure 44

Material.—Station 425; 69-63 m. One specimen.

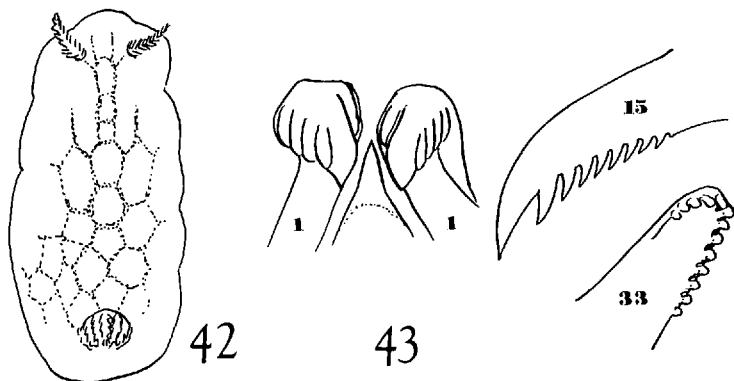
Description.—The animal is strongly contracted, and measures 20 mm linearly, 38 mm over the back, 18.5 mm broad, and 8 mm high. As the foot is folded longitudinally, the width of the smooth hyponotum (9 mm) possibly appears too great.

The color of the preserved slug is pale orange, with brown dorsal spots. These single chromatophores or groups are distributed without relation to the papillae.

The papillae of the back are very irregular, and obscured by crystals of the fixative. The distance between the papillae surpasses their diameter which is about 0.3 mm in the large ones. Rough spicules, up to 1 mm long by $60\ \mu$ thick, form rays under the bigger papillae and lie obliquely between them; smaller ones project from the papillae. These are not caryophyllidia. Many small spiculate papillae stand on the margin of the notum and around the pits of rhinophores and gills.

The tentacles are contracted and have a cleft on the outer side. The rhinophores bear about 20 spiculate perfoliations, not all complete. There are six slightly pigmented, pluripinnate gills surrounding a thick, blunt anal papilla. The free stomach is very large and contains sponge tissues; it bears dorsal longitudinal ridges. The caecum is also free and large.

The labial cuticle is smooth. The radula (Fig. 44) measures 4.3×2.6 mm; its formula is $40-42 \times 6.37.0.37.6$. The lateral teeth are smooth



FIGURES 42-43. *Chromodoris neona* (Marcus): 42, dorsal view of preserved slug, colors faded out; 43, radular teeth.

hooks, the first $92\ \mu$ high, increasing to $210\ \mu$ for the 34th tooth, which has the broadest cusp ($32\ \mu$). The 28th tooth has the longest cusp ($210\ \mu$). The three inner of the six pectinate teeth have a distinct, simple inner cusp.

The body cavity was filled with coagulated masses, so that the reproductive organs could not be dissected completely. A racemose ovotestis with loose follicles, and a semiserial arrangement of the bursa and the seminal receptacle were seen.

Discussion.—As the skin and the reproductive organs could not be analyzed sufficiently, we did not name the specimen. Its radula is certainly distinct from the Atlantic, Mediterranean, South African, and South Californian species. The last, *Th. bimaculata* Lance (1966: 72), has a spiny penis, and so contrasts with the type-species and the diagnosis of *Thordisa* (Bergh, 1877: 540; 1878: 568). The reproductive organs are often neglected in the descriptions referring to species of *Thordisa*. For example, it is not known whether *Th. sanguinea* Baba (1955: 20, 47; Abe 1964: 54, 86) has an unarmed male organ. The recorded characters of that species are very similar to those of *Th. bimaculata*.

12. *Peltodoris hummelincki igla*, subsp. nov.

Figures 45-47

Reference to P. h. hummelincki.—Marcus, 1963: 27.

Material.—Station 330; 127-63 m. One specimen.

Distribution of P. h. hummelincki.—Netherlands Antilles, Aruba and Curaçao, shallow water.

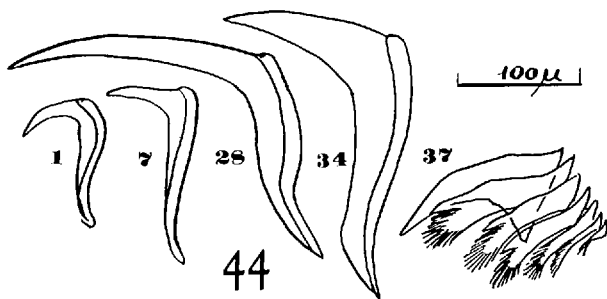


FIGURE 44. *Thordisa* spec.: radular teeth.

Description.—The well-stretched, stiff slug is 30 mm long, 16.5 mm broad, and 8 mm high. The length of the foot is 21 mm, its width 8 mm; its sides bear quite small, pale grey spots. The sole is white. The notum is light brownish grey with darker flecks, about 1 mm in diameter. These flecks are formed by subepidermal pigment cells. Some small spots around the area of the visceral hump are especially dark.

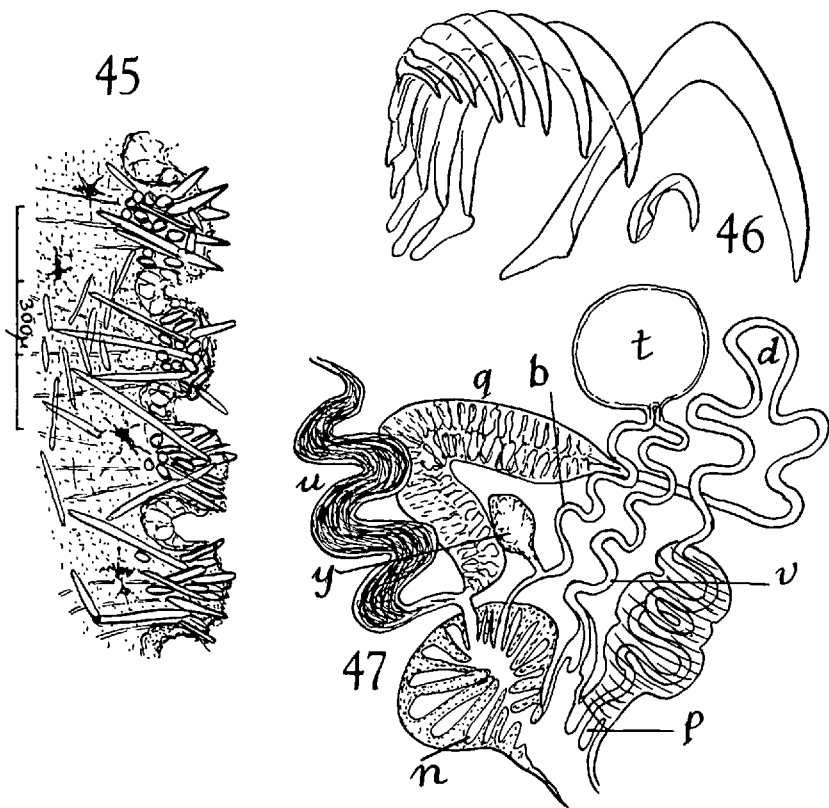
The sculpture consists of densely set, short papillae (Fig. 45). They are about 0.1 mm high and thick, their distance from one another is smaller than their diameter. They are full of spicules, so that the aspect differs considerably from the typical form (Marcus, 1963: Fig. 35). Some chromatophores in the papillae and under them produce the general color. The spicules stand out over the tip of the papillae. As in the typical form, the papillae of the present subspecies are not caryophyllidia.

As in other Discodoridinae, a piece of the notal rim is autotomized. The tentacles are short cones. The pits of the rhinophores and the gills are contracted. The rhinophores are pigmented and have about 25 leaves; the tip of the club is white. There are six brown tripinnate gills. The anterior border of the foot is bilabiate, with a distinct notch in the upper lip.

The labial cuticle is smooth. The radula (Fig. 46) is 3 mm long, 2.55 mm broad, and comprises 39 hook-shaped teeth in the half-row. The innermost tooth is 85 μ high and bears a prominent expansion near its base. The teeth are evenly rounded, so that base and cusp are indistinguishable. The 28th tooth is the biggest; it measures 310 μ . The 10 outer teeth decrease in size. The stomach lies free, as does the small caecum.

The reproductive organs (Fig. 47), especially the female ones, are young. The ampulla (*u*) is filled with autosperm (Thompson, 1966: 346), and the innermost glandular section of the efferent duct, the prostate (*q*), is bent as in the typical subspecies. The following coiled muscular efferent duct (*d*) leads to the penial papilla (*p*) in the heavily muscular male atrium.

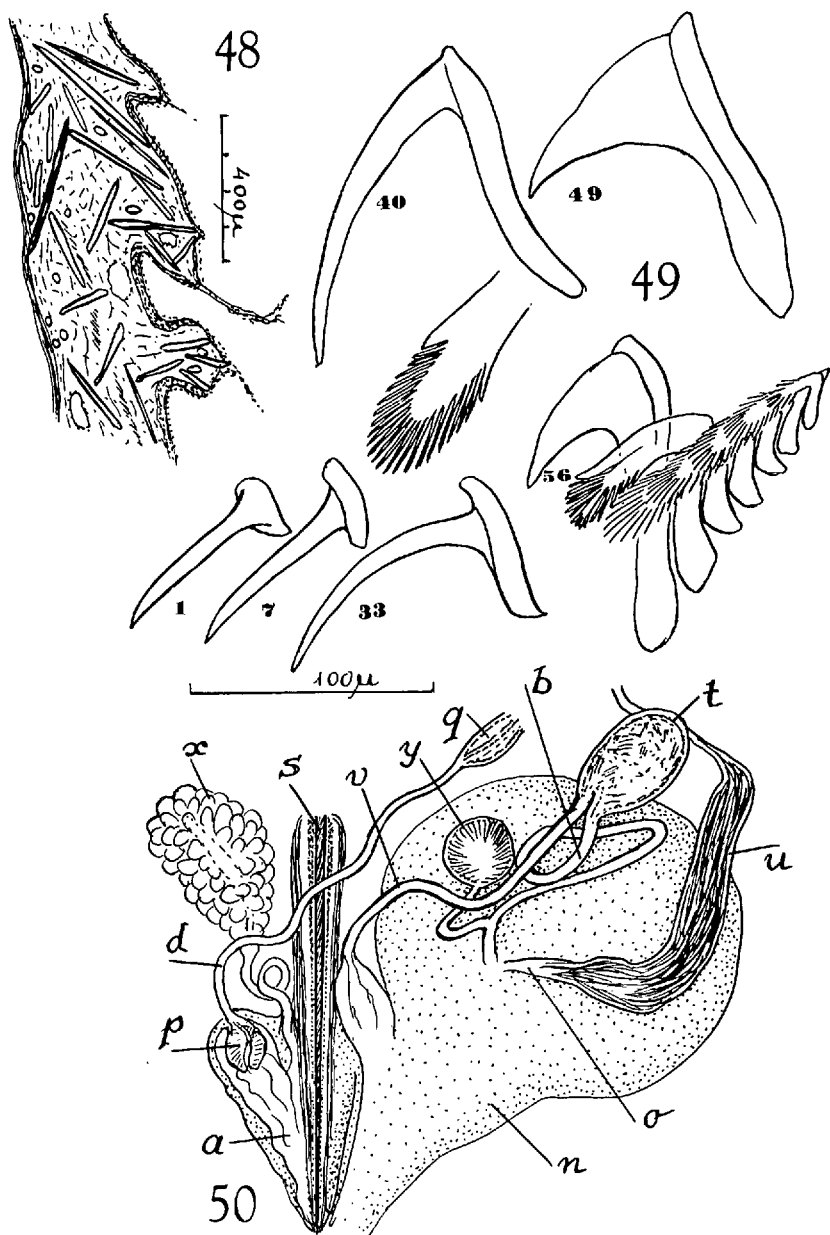
The pallial oviduct (*n*) is much smaller than in the previously examined



FIGURES 45-47. *Peltodoris hummelincki igla*, subsp. nov.: 45, dorsal papillae; 46, radular teeth; 47, diagram of reproductive organs.

full-grown slug (Marcus, 1963: Fig. 34, w), and not yet differentiated into the sections which produce the albuminous layer, the membrane, and the layer of mucus. The pallial oviduct receives the insemination duct (*b*) near the entrance of the quite short coelomic oviduct, and its outer opening is not separated from the apertures of the vagina (*v*) and the male duct. The serial arrangement of the seminal reservoirs is the same as in the typical subspecies; both are still empty. The spermatheca (*t*) is globular. The epithelium of the spermatocyst (*y*) is thrown into folds. The vagina opens between the penis and the nidamental duct.

Discussion.—The great number of spicules distinguishes *P. h. igla* from *P. h. hummelincki*. The differences in the ectal parts of the reproductive organs are probably due to differences in age. The radular diversities, however, may be specific or subspecific. The radula of a preserved 27-mm



FIGURES 48-50. *Nuvuca lurca*, g. nov., sp. nov.: 48, dorsal papillae; 49, radular teeth; 50, diagram of reproductive organs.

slug of *P. h. hummelincki* measures 2.2×2.0 mm compared with 3.0×2.55 mm in the present animal, and its teeth are shorter, 45-140 μ compared with 85-310 μ . Still more significant is the number of rows, 25 in *P. h. hummelincki* and 17 in *P. h. igla*, and the number of teeth per half-row, 32 and 39, respectively. A certain difference in the shape of the hooks, Figure 47 and the previous Figure 33 (Marcus, 1963), may be due to the different position of the radulae on the slides.

Nuvuca, gen. nov.

Discodoridinae with strongly spiculate body, unequal papillae on the notum, smooth labial cuticle, inner radular teeth with short base and long cusp, and pectinate outer teeth. A dart and a gland joined to the male atrium. Penis pleurembolic, unarmed. Seminal receptacles in serial arrangement.

Type-species.—**Nuvuca lurca**, spec. nov.

13. **Nuvuca lurca**, spec. nov.

Figures 48-50

Material.—Station 396; 67-69 m. One specimen.

Description.—The linear length of the well-stretched animal is 14 mm. The borders of the notum are somewhat rolled in, so that the breadth, measured at 9 mm, is probably 11 mm when the notum is expanded. The height is 5.5 mm, the width of the hyponotum 5.5 mm, that of the sole 3.5 mm. Alive, the notum was dull orange, the papillae were cream color, the rhinophores and the gills dull brown (F. M. Bayer). There are no spots of pigment.

The papillae of the notum (Fig. 48) are of very different size, larger and smaller ones are mixed. The distance between them is greater than their diameters; they range to 0.4 mm thick, and are as high as wide, or higher. The tubercles contain great numbers of upright spicules; under them lies a dense felt of smooth spicules which range up to 0.9 mm long, and about 40 μ thick. A layer of mucus covers the tips of the papillae and is prolonged into broad, firm threads projecting far beyond the high tubercles. The hyponotum is smooth and stiffened by numerous spicules. The borders of the rhinophoral and branchial cavities are jagged; the flaps around the rhinophoral pits are bigger than those of the branchial pouch.

The tentacles are pointed and have a short outer slit; the rhinophores have about 20 pigmented leaves. The four tripinnate gills are also pigmented; a scar seems to indicate that part of the branchial basket has been bitten off. The anal papilla is high and blunt. The anterior border of the foot is grooved and entire, not notched.

The labial cuticle is smooth. The formula of the radula (Fig. 49), which is 3.3 mm long by 1.6 mm wide, is $56 \times 6.56.0.56.6$. The inner lateral

teeth have short bases ($26\ \mu$) and very long, needle-like cusps ($68\ \mu$). Toward the middle of the half-row both the bases and the cusps increase to $130\ \mu$, decreasing farther outward. Of the six marginal teeth, the innermost has an inner cusp and a feathered edge; the following ones have only feathered edges. The large stomach lies free and contains big pieces of sponge tissue with few spicula. The caecum also projects free on the surface of the liver.

The reproductive organs (Fig. 50) of the single specimen were not analyzed completely. The exit of the ampulla (u), the sperмовiduct (o), evidently divides within the female gland mass (n). The efferent duct (d), between the folded prostate (q) and the penis (p), is rather long. The globular penial papilla lies in the fundus of the muscular male atrium (a). The deep atrium is connected with a straight dart (s) and a big, racemose gland (x), whose winding duct opens between the penis and the stylet. This grey dart is entally $0.15\ \text{mm}$ in diameter; it is broken into several pieces. It is produced by the epithelium of a muscular sheath, and consists of conchiolin with a calcareous cover. Its inner extension was not seen during the preparation; it may be longer than measured ($4\ \text{mm}$).

The vagina (v) arises from the pallial oviduct without a separate outer opening. It begins wide, then it narrows and courses to the spermatheca (t) or bursa. The insemination duct (b) leaves the spermatheca by a separate opening and runs serpentine to the gland mass (n), which it enters near the entrance of the sperмовiduct (o). Shortly before its inner opening the insemination duct bears a globular spermatocyst (y) or seminal receptacle, whose silky appearance is produced by the sperms arranged in parallel in its lumen. The allosperms (Thompson, 1966: 346) are fixed to the wall by their heads.

Discussion.—The pectinate marginal teeth, and the dart ("hasta amatoria" of Bergh's terminology) between the reproductive apertures, suggest a comparison of the present species with *Audura maima* (Bergh, 1878: 567), the monotype of its genus. We do not know of any further descriptions of this or any other species of *Audura*. The labial rodlets and the denticulate innermost teeth of the radula of *A. maima* differ greatly from those of *Nuvuca lurca*. The very weak sculpture of the notum ("notaeum sublaeve") also contrasts with that of our species.

Jorunna Bergh, first mentioned 1876 (p. 414, note 1) and described several times (1881: 114; 1884: 683; etc.), has a smooth labial cuticle, an unarmed penis, and a spine with a gland annexed to the reproductive terminations, but the peculiar flaps of the anterior margin of the foot and the radula separate *Jorunna* from *Nuvuca*. *Jorunna* ? *atypha* Bergh (1881: 125) in some respects differs less from *Nuvuca lurca* than it does from the type-species of *Jorunna*, and might belong to the present genus. *Kentrodonis* Bergh (1876: 415), with a penial spine, is more distant. For the relations

between *Jorunna* and *Kentrodoris* we refer to Bergh (1880: 46), Eliot (1910: 149) and Odhner (1939: 26, 27). The other genera of the Dorididae with a dart are too different from *Nuvuca* in other characters to require a special comparison.

ZOOGEOGRAPHIC REMARKS

The previously described species in the present collection are nearly all West Atlantic warm water species; one of them (*Bulla occidentalis*) was also recorded from the Canaries. An amphi-American species is *Philine alba*, discovered in Southern California and now obtained from the Mosquito Gulf. Probably it is related to a species from Japan.

Of the new species and sub-species, *Akera bayeri* has a conchological resemblance to an Indo-West Pacific species, and *Nuvuca lurca* has a remote relationship with a little-known Mediterranean *Jorunna*. *Peltodoris hummelincki igla* is morphologically close to *P. h. hummelincki* from the Netherlands Antilles.

ZUSAMMENFASSUNG

Im südwestlichen Karaibischen Meer hat das Forschungsschiff "John Elliott Pillsbury" vor der Küste von Kolumbien und Panama 13 Opisthobranchierarten gesammelt, meist aus Tiefen unter 50 m. Neue Arten und Unterarten sind: *Scaphander darius*, *Akera bayeri*, *Peltodoris hummelincki igla* und *Nuvuca lurca*, g. n., sp. n. Das männliche Organ von *S. darius* ähnelt dem von *S. lignarius*, hat aber eine mit Warzen besetzte Penisapille. *A. bayeri* ist der erste amerikanische Vertreter der Gattung *Akera*. Durch ein mit dem männlichen Organ verbundenes Stilett mit Drüse nähert sich *Nuvuca* den Gattungen *Audura* und *Jorunna*. Von den schon bekannten Arten der Sammlung hat eine der beiden *Philine*-Arten ein versenktes Gewinde wie *Ph. infundibulum*, und wie bei dieser ist jede der paarigen Kaumagenplatten sehr ähnlich einer Hälfte der unpaaren Platte. Die andere *Philine* ist mit *Ph. alba* von Südkalifornien identisch. Jetzt ist sie im Moskito-Golf gefunden worden (295-109 m), ist also eine amphi-amerikanische Warmwasserart.

RESUMO

No sudoeste do Mar das Caraibas, diante das costas da Colômbia e do Panamá, o navio de pesquisas "John Elliott Pillsbury" colecionou 13 espécies de opistobrânquios, provindos, principalmente, de profundidades além de 50 m. Novas espécies e subespécies são: *Scaphander darius*, *Akera bayeri*, *Peltodoris hummelincki igla*, e *Nuvuca lurca*, g. n., sp. n. O órgão masculino de *S. darius* assemelha-se ao de *S. lignarius*, mas, a papila penial é provida de verrugas. *A. bayeri* é o primeiro representante Americano do gênero *Akera*. Pelo estilete e a glândula anexos ao órgão masculino *Nuvuca* aproxima-se a *Audura* e *Jorunna*. Das espécies já conhecidas da coleção uma *Philine* tem a espira imersa como *Ph. infundibulum* e, como

esta, cada uma das placas pares da moela é quasi igual a uma metade da placa ímpar. A outra *Philine* é idêntica a *Ph. alba* da California meridional. Agora foi encontrada no Golfo dos Mosquitos (295-109 m), portanto é espécie anfi-americana das águas quentes.

TABLE 1
LIST OF LOCALITIES WITH SPECIES OBTAINED

PILLSBURY Station	Date	Location	Depth (m)	Species
	July 1966	<i>Panama Canal Zone, Limón Bay, oppo- site Cristobal</i>		
319	4	9°21.0'N, 79°57.0'W	—	<i>Chromodoris neona</i>
		<i>Colón, Panamá to Gulf of San Blas</i>		
330	8	9°37.5'N, 78°54'W	127-63	<i>Peltodoris hummelincki igla</i>
		<i>Gulf of Uraba to Cartagena, Colombia</i>		
365	13	9°31.3'N, 76°15.4'W	56-58	<i>Bulla occidentalis, Scaphander darius</i>
367	13	9°31.1'N, 75°49.6'W	36-34	<i>Haminoea elegans</i>
372	13	9°45'N, 76°12'W	100-81	<i>Bulla occidentalis</i>
375	14	9°59'N, 76°02'W	134-129	<i>Scaphander watsoni rehderi</i>
381	14	10°17'N, 75°59.9'W	724-597	<i>Scaphander clavus, Philine cf. infundibulum</i>
		<i>Cartagena, Colombia, to Gulf of Uraba</i>		
388	15	10°16'N, 76°03'W	814-1050	<i>Scaphander clavus</i>
392	16	9°45.1'N, 76°9.1'W	78-74	<i>Bulla occidentalis, Scaphander darius, Umbraculum plicatum</i>
393	16	9°46.2'N, 76°10.9'W	87	<i>Akera bayeri</i>
394	16	9°28.6'N, 76°26.3'W	416-634	<i>Scaphander clavus</i>
396	17	9°18.2'N, 76°24.8'W	67-69	<i>Nuvuca lurca</i>
398	17	9°05.6'N, 76°32.1'W	174-158	<i>Scaphander darius</i>
402	17	8°51.2'N, 77°01.6'W	72	<i>Scaphander darius</i>
403	17	8°48.7'N, 77°12.7'W	98-96	<i>Scaphander darius</i>
		<i>San Blas Point</i>		
425	19	9°38.9'N, 79°15.3'W	69-63	<i>Scaphander darius, Thordisa spec.</i>
		<i>Gulf of Mosquitoes</i>		
434	20	9°14.6'N, 80°21.8'W	49-47	<i>Scaphander darius</i>
445	21	9°02.3'N, 81°23.8'W	338-342	<i>Scaphander watsoni rehderi</i>
446	21	8°58.1'N, 81°26.3'W	109-295	<i>Scaphander watsoni rehderi Philine alba</i>
447	21	9°07.4'N, 81°11.8'W	657-673	<i>Scaphander clavus</i>
448	21	9°10.1'N, 80°55.6'W	952-869	<i>Scaphander clavus</i>

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